2. The species status abbreviations in this article are shown in the following format:
Upper case letters indicate a federal listing in the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act); lower case letters indicate a state listing in the Advisory Lists of Threatened Species.
CR/cr = Critically Endangered, E/e = Endangered, V/v = Vulnerable.

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Scientists, agencies and community working together: a key need for invertebrate conservation in Victoria

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Abstract

Cooperation of scientists, conservation agencies and the wider community is critical for pursuing invertebrate conservation, but many problems can arise in promoting this approach effectively. They are exemplified here by consideration of four notable flagship species in Victoria: the Giant Gippsland earthworm, Golden sun-moth, Eltham copper butterfly and Ancient greenling damselfly, which are supported to varying extents by recovery teams and normal recovery plans and by community enthusiasm and participation in their conservation. A fifth example of 'working together' is the Invertebrate Survey Group of the Field Naturalists' Club of Victoria, whose activities are discussed in the context of broader needs to promote values of community participation.
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Key words: Invertebrate conservation, scientists, agencies, volunteers, recovery teams

Introduction

Conservation management, widely seen as essential for the wellbeing of species and natural environments, has many centres of interest, each with implications well beyond the immediate focus of attending a particular threatened species, site or biotope. However, many of the less obvious or least known groups of organisms receive little consideration, or efforts for conservation. The need for 'working together' for conservation extends far beyond the most popular animals (especially birds and mammals) and vascular plants. The massive taxonomic and ecological diversity of invertebrates and their roles in the provision of essential ecological services that help maintain life has been the subject of many books and papers over the last 30 years, with awareness of their importance catalysed through a key essay by EO Wilson (1987). In terms of number of species, invertebrates dominate the global fauna. Estimates of the numbers of non-marine invertebrate species on Earth have varied widely, with estimates in excess of 30 million species. However, a more recent estimate puts the figure at around 3.7 million species of which around two thirds are not named (Hamilton *et al.* 2010). If this figure is correct, then Australia could be home to around 10% of the world's fauna—an estimated 300 000 species of which fewer than half have been formally named (Yen and Butcher 1997). However, the number of 'species' does not properly reflect the variety present. Molec-

ular studies continue to reveal large numbers of 'cryptic' but distinctive forms in almost all cases examined, and it becomes somewhat subjective as to whether some of these should be considered formally distinct.

Only a minute fraction are considered in conservation decision-making, with an emphasis on species or subspecies that have been designated in some way as 'threatened'. In Victoria, more than 40 species are listed under the *Flora and Fauna Guarantee Act 1988 (FFG)* and many more are signalled in the *Advisory List* of *Threatened Invertebrate Fauna* (Victorian Department of Sustainability and Environment 2009). Five of these species are also listed under the Commonwealth *Environment Protection Biodiversity Conservation Act 1999 (EPBCA)*. The discrepancy in the number of species listed under State and Commonwealth legislations in part reflects the differing criteria used to assess conservation status, with the Commonwealth placing greater emphasis on population viability analyses. Reliable information on population numbers for invertebrates is almost invariably lacking. In Victoria, the listing of many threatened species (especially the beetles and butterflies) is based primarily on information provided by amateurs, hobbyists, and insect collectors. This information would not be accumulated without this resource and highlights the importance of volunteers in assisting conservation programs, even at the most basic level of gathering information to aid setting of priorities. On a broader perspective, the reason that butterflies are amongst the most informative insect groups in conservation assessments is simply that the biological and distributional information accumulated over more than a century of collector enthusiasm provides a template far more complete than for any other group.

Besides providing fundamental information about threatened species, these 'amateurs' are also important contributors to many practical aspects of the conservation of threatened species. In theory, the listing of a threatened species should result in the formation of a recovery team to guide the recovery process, and include representatives of all the major community and other constituency groups with interests in the conservation program (New 2009). Members of recovery teams should include people with relevant expertise for the species: technical experts, managers (Department of Environment and Primary Industry (DEPI), Parks Victoria (PV), Shires, Councils), and community members. Listing under *FFG* obliges the preparation of an 'Action Statement' setting out the major needs for conservation. A fuller recovery plan is not mandated under this Act, but in some other places is regarded as a routine requirement.

However, whilst there is wide recognition of the importance of recovery teams to oversee conservation programs that may be both biologically and politically complex, and extend over many years, there are only three recognised invertebrate 'recovery' teams in Victoria (for the Giant Gippsland earthworm, the Eltham copper butterfly and the Ancient greenling damselfly), and these are noted below. These three taxa are classic centres of invertebrate conservation interest in Victoria, and fuller historical accounts of this interest are included in Yen *et al.* (1990). The theme of community and managers working together is exemplified by four case studies presented here to assess how different groups work together to ensure the conservation of listed threatened taxa: these cases concern the above three, plus the Golden sun-moth, for which there is no formal recovery team. A fifth case study, involving the Field Naturalists Club of Victoria Terrestrial Invertebrate Survey group, is included because it highlights issues faced by volunteers when working with invertebrates, and demonstrates some of the wide range of issues that can arise in doing so, and some of the major needs to enhance such critical support from the wider community.

Working together case study 1: the Giant Gippsland Earthworm

The Giant Gippsland Earthworm (GGE), *Megascolides australis* McCoy (Oligochaeta: Megascolecidae), is a well-publicised species that is restricted to a small region of South Gippsland. It is subterranean and does not venture above ground, so is difficult to survey. *M. australis* is apparently long-lived and has a very low reproductive rate. Its body is very fragile and individuals generally die if their skin is broken (Van Praagh *et al.* 1989). Despite this, the worm has survived major change in above-ground

vegetation since European settlement with the conversion of wet forests to pastures, although there is an apparent decline in range and abundance (Van Praagh and Yen 2010). Most known populations occur on private land.

Early observations on the GGE were undertaken by members of the Field Naturalists Club of Victoria, Baldwin Spencer and Charles Barrett (Barrett 1929, 1930, 1931; Spencer 1888). In the 1960s to 1970s, Brian Smith (National Museum of Victoria and FNCV) also made observations of the GGE and, more notably, conducted a land owner survey of the region to map its distribution (Smith and Peterson 1982). The first attempt to study the ecology of the GGE was undertaken by Van Praagh (1992) and further surveys were undertaken to delineate and identify the habitat factors determining its distribution (Van Praagh *et al.* 2007). Evidence for the decline of the GGE was based on loss of the species at previously occupied sites—generally based on land holder recollections. The main threats were considered to be land clearance (tree removal and loss of or changes to the soil habitat) and agricultural practices (ploughing, chemical additions to the soil). Tree planting was seen as a possible conservation measure. With further studies, the main threats are now seen as subdivision of farms for urban development, new agricultural systems that rely on heavy use of chemicals, and inappropriate tree planting. The main threat to the GGE is change in hydrological regimes associated with land use changes. In an unpredicted reversal, dairy farming that considers the needs of the GGE is the best chance of long-term survival (Van Praagh *et al.* 2007).

The Giant Gippsland Earthworm Recovery Team operates under the *EPBCA* and the *FFG*. It has relied on small financial contributions from DSE, used for running the Recovery Team, and small research projects to answer management questions. The membership of the Recovery Team has primarily comprised technical experts and land managers. Attempts to involve community groups (such as Landcare groups) in the Recovery Team have not been very successful. Limited input by volunteers has enhanced distributional surveys, for example, by the Friends of the Museum. The most important community group not formally on the Recovery Team is the farming community of South Gippsland, which has provided invaluable support in permitting research on their properties, and provided historical information and local contacts.

Because of its size, the GGE presents different technical constraints compared to working with many of the smaller species. It is certainly charismatic, acknowledged as an important local animal, and well respected by the local community; however, its subterranean habitat and its fragile body are major constraints to working with this species.

Working together case study 2: the Golden sun-moth

The Golden sun-moth (GSM) *Synemon plana* Walker (Lepidoptera: Castniidae) is associated with native temperate grasslands in the ACT and in Victoria. It is believed to have an 18 to 24 month life cycle. Its caterpillars are subterranean, feeding on roots of grasses, and adults emerge in late spring-summer and are active for only a few days (Gibson and New 2007)). The females are flightless, so detection is based on flying males; the unpredictable brief flight period, in conjunction with enormous variation in population sizes between years, makes this species very difficult to monitor. The caterpillars apparently feed on wallaby grasses, *Austrodanthonia* spp., but a dilemma has arisen in that there is evidence that they also feed on the introduced Chilean Needle Grass *Nassella neesiana* Trin. et Rupr., a declared noxious weed (Richter *et al.* 2013). In both the ACT and Victoria, the better known occurrences have been on remnant native grasslands that are now prime real estate or in demand for industrial development sites. GSM is listed under both the *FFG* and *EPBCA* and is listed as Critically Endangered under the *EPBCA*—the highest conservation risk status available for an extant taxon. It is listed also under the local acts for the Australian Capital Territory and New South Wales.

There is no recovery team for the GSM. The conservation agenda is driven by development: largely through competing private consultancy firms pursuing the survey obligations of environmental close-up impact statements on grasslands sought for development; some train and

pay community groups to do surveys. Despite the valuable inputs of many community groups, such as the Merri Creek Management Group and the Victorian National Parks Association, information on this species is fragmented. It is an important flagship for native grasslands in the region, and conservation management is also politically charged, leading to heated debates over principles of habitat offsets and other matters (New 2012). There is considerable need for a national recovery team to guide the somewhat fragmented conservation interests for this moth. Effective field surveys for this species remain a dilemma because its unpredictable periods of above-ground activity require either many people working simultaneously in the field or new technologies to detect larvae or adults.

Working together case study 3: the Eltham copper butterfly

The Eltham copper butterfly (ECB) *Paralucia pyrodiscus lucida* Crosby (Lepidoptera: Lycaenidae) depends on *Bursaria spinosa* Cav. as the sole larval food plant and *Notoncus* spp. ants to tend larvae. It occurs as fire-age related eucalypt woodland metapopulations in Eltham, Greensborough, Bendigo, Castlemaine, Wail and Kiata (Canzano *et al.* 2007; Bayes *et al.* 2012). The ECB attracted public attention when it was 'rediscovered' in 1987 when a major subdivision project was proposed in Eltham, in outer north-eastern Melbourne (New 2011). While the subdivision went ahead, public pressure resulted in the establishment of three reserves for the butterfly. It was listed under the *FFG* but has not been listed under the *EPBCA* despite recommendations for it to be listed nationally (Sands and New 2002). The Eltham Copper Butterfly Working Group was established to coordinate and oversee the conservation of this taxon. The Working Group supervised the annual monitoring program, and maintained a 'watching brief' on site management and rehabilitation issues (including fire management), survey for new sites, and promoting the ECB through educational activities. The group is faced with a challenging task in the Melbourne sites (Eltham and Greensborough) because the ECB is found in small isolated and change-prone reserves within an urban setting, and these are supervised by a variety of managing agencies. The ECB populations are conservation dependent in that they are unlikely to survive in perpetuity without human intervention. The metapopulation structure of ECB populations means that they require adequate and accessible suitable habitat to maintain their populations. The habitat is fire-age dependent, and this is difficult to maintain in the urban environment.

As a result of its high profile within urban settings in Melbourne, conserving the ECB has required the involvement of a broad range of stakeholders. The ECB working group has guided conservation actions based on the *FFG* Action Plan (Webster 1993). The group comprises technical experts who provide scientific input regarding insects, plants, and ecosystem processes (primarily fire); land managers (Parks Victoria, Nillumbik Shire, Banyule City Council) overseeing and undertaking site management (including weed control, rubbish dumping, planning issues); DSE biodiversity staff to assist on Government policies and priorities and regional surveys and site management; and friends groups (Friends of the ECB assist with surveys, site restoration, publicity at Eltham; Friends of Kalimna Park undertake similar activities at Castlemaine). Other community groups that have been involved include the Country Fire Authority who assisted with an ecological burn of one of the Eltham reserves; Australia Post at Eltham who assisted with a school's art contest and also set up an ECB post mark; and local primary schools. Large numbers of volunteers have participated in the annual larval and adult counts at Eltham, Greensborough and Castlemaine, and the recovery program would not have been possible without these volunteers. In 2012, the Friends of the ECB received a large Community grant for three years to conduct surveys and manage Eltham sites; they have thus essentially taken leadership in this important conservation endeavour.

While there has been considerable 'working together' for the ECB, the geographically broad distribution of the small populations has involved a large number of different groups in decision-making and to resource. This has resulted in disjunct management of ECB with emphasis on managing the conservation-de-

pendent populations located in Melbourne, possibly at the expense of the populations with potentially larger expanses of suitable habitat outside of Melbourne. However, even the populations around Bendigo and Castlemaine could be threatened by increasing urbanisation as well as large fuel reduction programs near population centres (New *et al.* 2010). Nevertheless, the differing conservation demands of 'rural' and 'urban' ECB populations necessitate local foci of interest, with the future role of the state-wide management group emphasising coordination and raising community support throughout Victoria.

Working together case study 4: Ancient greenling damselfly

The Hemiphlebia damselfly or Ancient greenling *Hemiphlebia mirabilis* Selys (Odonata: Hemiphlebiidae) occurs on a few small seasonal wetlands in Victoria, and it is found in southern South Australia, Flinders Island, and northeastern Tasmania. It is the smallest species of Odonata in Australia. Its discovery on Wilsons Promontory, at a time when it was widely believed to be extinct, aroused international interest in its conservation. The small recovery team was initiated through need to monitor the recovery of the Wilsons Promontory population after its primary site was accidentally burned (New 1993). The team has fostered interest in surveys, but the major local community interest has devolved on wetlands near Yea, for which community support has been instrumental in leading to greater recognition and protection. It represents the many cases of threatened invertebrates for which local sustained community support is perhaps the most significant ingredient in conservation, with appropriate agency support endorsing that enthusiasm.

Working together case study 5: the Field Naturalists Club of Victoria

The fundamental requirements for accurately determining the conservation status of invertebrates include adequate baseline information on distribution and population sizes from which to assess conservation need, in a context of understanding the species' life cycle and major resource needs. This information is in most cases fragmentary, and obtaining basic information through survey and observation is critical for conservation planning. The major foci are selected notable taxa, as above, or the broader complexities of completing large invertebrate surveys that potentially provide information on larger numbers of taxa and help to characterise assemblages or the variety of invertebrates associated with particular kinds of habitat. The Field Naturalists Club of Victoria (FNCV) and the Entomological Society of Victoria, as the major organisations with these interests in the State, have both run excursions and published lists of taxa collected by their members. Generally these have involved small numbers of taxa that are of interest to the members or for which taxonomic expertise is available to make accurate identifications. The study of insects within the FNCV has had a chequered history under the banner of the Entomology Group, Invertebrate Survey Group and now the Terrestrial Invertebrate Group.

The Invertebrate Survey Group (ISG) was set up to undertake broader surveys of selected locations rather than concentrating on selected taxa. Under the enthusiastic leadership of Ed Grey, a naturalist without an invertebrate background, the ISG undertook surveys at Glynns Reserve (Warrandyte) in 1997, Wilsons Promontory in 1998 and at Mt McKay in 1999. The survey at Glynns Reserve was extensive and involved a large number of participants. The ISG trained members to identify invertebrates to the morphospecies level for some groups and to family level for others. This was a complex undertaking for volunteers, and the results are still being analysed for writing up (Ed Grey, pers. comm. 2013). One short observational note originated from the Glynns Reserve (Grey 1998). The ISG published results from the McKay and Wilsons Promontory surveys (Grey 1999, 2002). It is noteworthy that many of the naturalists involved in these invertebrate surveys went on to be active participants in the highly successful Fungimap scheme. Fungimap was started at the FNCV and involved participants initially surveying for selected taxa, thus building up more detailed distribution records for each of the nominated taxa. As capability was built up, the number of taxa was increased and many participants were able to identify taxa that were not on the initial list. This approach has considerable potential also

for invertebrates, although differences in the biologies of fungi and invertebrates have considerable bearing on how it can be applied most constructively to the latter.

Discussion

Involving the wider community in invertebrate conservation projects is difficult but, equally, is a critical requirement to counter the small, and diminishing, level of resources available through government agencies for species-level conservation. Credibility and mutual goodwill are major components of this working together. How different groups work together with threatened species varies widely according to the identity of the species (the complexity of its biology affects the ease of working with it, and its distribution may not be 'convenient' for volunteer visits—either because of distance or permit requirements) and what drives the recovery process (statutory listing and development, charisma of the species). Perceived 'worth' of the focal species may also be important. The latter factors will influence the ease of getting resources to work on these taxa (as well as whether they are listed at both the State and Commonwealth levels). The effectiveness of the programs will often rely on leadership —whether this is an effective recovery team, or the perhaps less predictable and less heavily coordinated progress in the absence of such a formal group. Leadership will depend upon the enthusiasm of a small number of individuals, and in the case of invertebrates, the pool of available invertebrate expertise is small to begin with, resulting in efforts of the few informed individuals being 'diluted' across several projects.

Community involvement is critically important for invertebrate species conservation, both politically and practically. It provides voluntary advice and help and a local sense of ownership. However, harmonious cooperation requires 'officialdom' listening to community concerns and also gaining community trust. The dangers associated with linking recovery teams with the community include failing to recognise community understanding of ecological concepts, failing to appreciate community hopes/desires/capability, failing to provide continuing support and encouragement, and agency proprietorship. The facilitating features have been discussed extensively (New 2010), and frequently include respect, education, tact and effective communication, with interest retained well beyond the initial 'flush of enthusiasm' engendered when a threatened local species is first noticed. Within Australia, perhaps the most successful example has been for the Richmond birdwing butterfly *Ornithoptera richmondia* (Gray), with range-wide conservation including networks of several hundred volunteers and numerous schools also participating (Sands *et al.* 1997). Another significant group to be involved are indigenous Australians, whose knowledge of the environment can provide important insights.

Two important factors can determine the effectiveness and longevity of programs involving volunteers. First, there is volunteer burn-out; volunteers may lose interest or take up other interests as individual circumstances and priorities change. Second, the potential 'us and them' conflict between 'professionals' and 'volunteers' where the outcomes desired by professionals may not align with those of the volunteers and lead to a negative impact on voluntarism (Podjed and Muršič 2008).

Successful recovery programs depend upon community groups and volunteers. However, the pool of volunteers is often small and has high turnover rates. Some programs have a small number of long-term volunteers but, in both contexts, fatigue sets in or other interests and priorities impose and reduce volunteer numbers. The larval and adult Eltham Copper butterfly counts have been conducted for 20 years at Eltham, during which time it has been difficult to sustain a pool of volunteers. One of the barriers is that monitoring is a long-term activity and it is difficult to demonstrate instant measurable benefits as a result of volunteer labours.

These issues have been identified here for only four taxa—less than 10% of listed threatened Victorian invertebrates and only a minute fraction of the invertebrate fauna that merits, parallel attention but that are never likely to receive it. Even the listed species are, for the most part, largely neglected in conservation action, Except for sporadic attention from individual interested people. Those species must be placed in the wider context of a largely undocumented invertebrate fauna, and it is pertinent to con-

sider briefly if wider inventory surveys can contribute usefully to practical conservation.

The effectiveness of broader invertebrate surveys depends on their purpose. Many are underaken simply to collect species from particular sites or biotopes as initial inventories to enumerate taxa present, with little regard to understanding how they fit into the broader environment. More rarely, surveys can be ecological undertakings to provide information on habitat management. Whatever the purpose, they can be rewarding experiences, yielding new information and providing excellent opportunities for education and increasing awareness of invertebrate life, and of the difficulties of enumerating and studying it. One problem is that the outcomes of such efforts may not be seen for a considerable period, because of difficulties and lack of expertise and facilities to sort and identify the specimens accumulated. For example, the recent Bioblitz surveys funded by the Australian Government have collected many new species from a number of locations across Australia. They have benefited taxonomists and museum collections, but the longer-term benefits are not yet clear. The Bioblitzes, and related surveys over the years, have included participation by volunteers, so one benefit has been capability training. Nevertheless, and cynically, it is easy to see these as 'smash and grab raids' rather than serious scientific endeavour, and maintaining community credibility may be difficult. Even the process of collecting invertebrates can pose ethical dilemmas.

Invertebrate surveys, whatever their objectives, generally result in the collection of large numbers of specimens, including many undescribed species. It is generally easier to get volunteers for field work, but it is more difficult to train and maintain a group to sort and identify the material. The result is that some surveys never see completion, but information is garnered from analysis of selected taxonomic groups, for which knowledge and/or capability is available. The FNCV ISG surveys are an outstanding example of two surveys that were completed and one, the more complex survey, still being worked on some 16 years after field work: again we emphasise the difficulties of working with poorly documented faunas. The FNCV ISG has shown that amateur groups can successfully complete this type of work, but this approach has new barriers such as (1) the rising cost of materials required to store specimens properly; (2) the unwillingness of more institutions to accept collections for long-term storage because they are running out of space; and (3) a decline in invertebrate specialist expertise to assist them. All are important constraints; a standard 10-drawer insect cabinet now costs well over $2000; both storage space and curatorial capability are limiting; and, at a time when calls to 'document biodiversity' have never been greater, many institutions have reduced capability to do so, and the relevant background education is decreasing in tertiary institutions. Invertebrate experts are themselves becoming a threatened species because of reduced training in tertiary institutions, the reduction in the teaching of traditional biology in favour of molecular based biology, mathematical modelling on less and less empirical data, and environmental management based on surrogates for biodiversity (such as assuming that plant communities are an effective surrogate for associated faunal communities).

Nevertheless, goodwill to participate is clearly present. Contrasting interest in invertebrates with that in birds, for example, reveals the enviable volunteer base that participates in the activities of Birdlife Australia. Some of the impediments to achieving relative parity are due simply to working with invertebrates. First there is the public relations barrier: invertebrates are not popular with a high proportion of the public because some are health, agricultural, structural or amenity pests. The general unfavourable image renders gaining political support for invertebrate projects difficult. Lack of information on species identification, biology and ecology, distribution and habitat requirements for most species links with more technical issues associated with working with invertebrates: small body size, very different life history stages, some can be difficult to collect, high temporal and spatial species turnover (most are very seasonal) lots of different species, many of which have not been formally described and do not have a binomial scientific name, or which cannot be identified without detailed specialist examination and comparison with large institutional collections.

The current government strategies across Australia seem to emphasise the concept of 'partnerships' with communities. While this is a laudable objective in terms of community participation, there is the danger that it is moving more responsibilities to volunteers while cutting budgets. In the words of a recent Environment Defenders Office press release in 2012, 'Although there is considerable reference to 'partnerships', this appears to be more in the nature of encouraging voluntary activity in the face of Government funding cuts, and does not actually include any real measures to give communities greater rights over environmental decision-making.'

If we require assistance from community groups and volunteers as exercises that are both profitable and harmonious, we need to be able to train them effectively and sympathetically, whilst conveying a strong sense of worth and partnership. The widespread low prominence of 'natural history' in Australia contrasts with the traditional outcomes of that interest elsewhere, and (together with a small population base) largely precludes local development of organisations paralleling those so effective in promoting invertebrate conservation in Europe or North America. For a major flagship group, butterflies, the initially UK-based organisation Butterfly Conservation with some 12 000 members, has recently expanded to become Butterfly Conservation Europe (Warren 2012), and the North American Xerces Society has expanded from its foundation interest in butterflies to encompass other invertebrates and their ecology, with a recent substantial emphasis on pollinator conservation (Black 2012). More widely in the United Kingdom, Buglife—The Invertebrate Conservation Trust—spans many taxa and activities (Stubbs and Shardlow 2012). Each of these groups employs permanent and contract-based administrative and scientific staff, and depends largely on fostering community interests; for them, 'working together' for invertebrate conservation has become reality with massive tangible benefits.

More immediate needs may depend on information given to the wider community to encourage participation in conservation of Australia's biological heritage, of which invertebrates are a major component. This progress could involve programs at the national or state level, but may be more effective if relevant local themes of flagship species are used. The Eltham copper is one such example, with local schools continuing to participate in community conservation effort and publicity. Increasing interest in local natural history can be promoted through younger school children, junior and older field naturalists, while gardeners could build a larger pool of capability. One important group that has to be considered is teachers because they can stimulate the interest of young children. However, who can train the trainers? Loss of 'succession' in natural history experience is widespread but, perhaps, nowhere more so than for invertebrates. The rapid loss of capability amongst professional and amateur entomologists, unless redressed, will leave a major gap that will be very difficult to fill. The problem is not unsolvable but may best be overcome through the widest possible community awareness and participation in conservation being canvassed. As Masters (1996: p. 202) commented 'Networks of conservation agencies, scientists and volunteers are the future of nature conservation in Australia'.

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Eighty Years Ago

SURVIVAL OF FAUNA

One of the marked features of modern times is the rapid elimination of native animals with the spread of colonization, the facilities for travel and communication, and the increasing deadliness of appliances used to destroy wild life. In Australia many types of fauna have already disappeared. Through many ages Australian animals, protected by open seas, isolating them from powerful and rapacious animals found elsewhere, had thriven under a sheltered life, and developed unique features. With the advent of the white man and his domesticated animals, and inter-relationship with every country, the balance of nature was inevitably disturbed. Now, unless very stringently protected by law, and by the force of an awakened public opinion, alive to its own interest in doing so, the remainder of our marsupial species, with the monotremes are doomed to extinction.

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